DOCUMENT RESUME

ED 245 124 CE 039 167

AUTHOR Long, James P.
TITLE Education for Jobs in a High Tech World: What Has Been Learned from Industry.
PUB DATE 5 Aug 84
NOTE 13p.; Opening address at the Virginia Statewide Vocational Guidance and Counseling Conference (Roanoke, VA, August 5, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Basic Skills; *Employer Attitudes; Futures (of Society); General Education; *High School Graduates; Industry; Innovation; *Job Skills; Secondary Education; *Technological Advancement; *Vocational Education

ABSTRACT

Educators are increasingly turning to employers for advice about educating for future jobs. A recent project involved conducting a series of seven national conferences on high technology to learn about innovations in industry. Experts from industry told educators that industry itself does a great deal of high technology training, computers are the core of high technology, not everyone needs to know programming, programming jobs will increase, few pharmaceutical/biomedical technicians will be needed, robotics has come of age, computer-assisted design is revolutionizing drafting, semiconductors are still "hot," proprietary schools do a better job of educating, communications are growing and changing rapidly, the aerospace industry and the military are setting trends and creating innovations, and software is in a predicament. A panel of the National Academy of Sciences reported on the employer's view of competencies needed by the high school graduate for success in the workplace. The panel found that (1) the major asset required of high school graduates is the ability to learn and adapt to change in the workplace, (2) there are 10 core competencies that can provide the basic understanding and skills needed to perform entry-level jobs, and (3) a positive attitude and sound work habits are of prime importance. (YLB)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED245124

# Education for Jobs in a High Tech World: What Has Been Learned from Industry

by

James P. Long, Ph.D.

Senior Research Specialist

Opening Address

Virginia Statewide Vocational Guidance and Counseling Conference

Roanoke, Virginia

August 5, 1984

National Center for Research in Vocational Education

The Ohio State University

1960 Kenny Road

Columbus, Ohio 43210

CE 039167

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

J Long

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Asking employers for advice about how best to educate youth for future jobs is the "in" thing to do these days. In a way, that's wonderful: we must prepare the next generation of workers for future jobs in our offices, factories, farms, and schools---and the education we provide should be relevant to the jobs that will be available. In another way, however, it's scary to realize how much pressure we're putting on young people to learn those skills that the world of work will buy, rather than to learn what their hearts and minds find interesting, exciting, and satisfying. Asking employers for advice about how to educate youth is certainly the right thing to do, and simultaneously the wrong thing to do. Asking employers for advice about how to educate youth involves both risks and benefits. I want to say so right from the start.

Granted then, that there is danger in asking employers for advice about education for future jobs, we seem to do it anyway. Your Secretary of Education of the Commonwealth of Virginia, Dr. John T. Casteen III, has just served on a national panel charged with presenting the employers' view of High Schools and the Changing Workplace: The Employers' View. The panel was convened for the National Academy of Sciences. Their report was made public in May of 1984---just a few weeks ago. My talk to you tonight will be based partially on that report, High School and the Changing Workplace: The Employers' View.

My talk tonight will be based also on some recent work of my own at the National Center for Research in Vocational Education. I'll begin with some of my own findings...a project that required me to conduct seven conferences: Dallas, TX; Nelsonville, Oh; Newark, NJ; Orlando, FL; Oakland, CA; Chicago, IL; and Greensboro, NC. I was asked to conduct a series of national conferences on high technology in order to learn as much as possible about innovations such as:

robots, CAD/CAM, electronics, lasers, telecommunications, fiber optics, biomedical engineering, microcomputers, videodiscs, and other such high technology devices. The plan was to listen to industry--to invite educators to attend the conferences to listen and to learn--to invite industry experts familiar with these topics to do the talking, making hour-long presentations about their own specialities. We asked the industry people to tell us only two things: (1) what their company does with high technology devices such as robots or CAD/CAM or lasers; and (2) what educators can do to prepare graduates for jobs in companies such as their own. We did allow the educators to speak eventually; they could ask questions to draw out details about the high technology device, or about what could be done to prepare people for employment in such fields. Their questions were asked during intensive small group question-and-answer sessions lasting one hour each. The speakers came from companies such as:

Bell Labs
Rockwell International
Motorola
International Harvester
Fermilab
Control Data
Sandoz Pharamaceutical
Cincinnati Milacron
Mead Digital
Texas Instruments
Westinghouse
AccuRay
Structural Dynamics
General Motors
Western Electric
IBM
Harris Corporation
Martin-Marietta
International Laser Systems
Sony
United Technologies
Bendix Corporation
Bechtel, and even
Atari.

Nearly 1000 persons attended these seven conferences over a one-year period and I will summarize for you some of the things we heard from industry. I am going to give straightforward conclusions about what was learned. These conclusions are necessarily oversimplified, but they do represent the best thinking of the experts who addressed us. Statements are not attributed to any specific expert or to any particular company, but it's not important to do so. The statements stand on their own merits. Here is one person's interpretation of the most important things learned from the seven high-technology conferences:

1. INDUSTRY ITSELF DOES A GREAT DEAL OF HIGH TECH TRAINING---Industry has entered the field of education in a big way to train people for high technology jobs because it is not satisified with the performance of so many persons trained by us, the professional educators. Industry sometimes makes a profit in its educational efforts. Often it saves money by doing its own training. Industry will soon be a major force in competition with colleges for students in high technology education.
2. COMPUTERS ARE AT THE CORE OF THE TERM HIGH TECHNOLOGY---Computers are the center of all high technology devices. Microprocessor chips are being used everywhere, and are revolutionizing manufacturing, communications, entertainment and service occupations.
3. NOT EVERYONE NEEDS TO KNOW PROGRAMMING---Not all workers will need to know computer programming, but it's hard to imagine an occupation that will not soon require some elementary computer literacy, or at least some keyboarding skills. Everyone needs to overcome computerphobia.

4. PROGRAMMING JOBS WILL INCREASE---Although not everyone will need to know programming, the number of programming jobs will increase dramatically. Despite high unemployment overall, one-quarter of a million good programmers could find jobs this year, and that figure will rise to nearly one million by 1990. This is a temporary increase, however. After 1990 fewer programmers will be needed.

5. FEW PHARMACEUTICAL/BIOMEDICAL TECHNICIANS---A negative signal came to us from the pharamaceutical and biomedical engineering fields. The technician doesn't fit in so well here, we learned. The medical manufacturing industry will not add a large number of jobs as a result of high technology. A few Ph.D. level biomedical engineers will make the discoveries, and robots will manufacture the medicines, then package them for sale. Otherwise all new health jobs will be in the service fields such as nursing or x-ray or lab technology.

6. ROBOTICS HAS COME OF AGE---Robotics has finally come alive after nearly 30 years of struggling to be born. Robots are not just a fad; they will take over many dirty, dangerous, repetitive jobs, and in the process they will create an equal number of new jobs needed to program, maintain and design robots. The reprogrammable robot will make it economically feasible to manufacture more specialty products in small amounts. This will, however, further reduce the benefits of a long-standing American specialty, the mass-production of generic products.

7. NO MORE DRAFTING TABLES---CAD (that's computer-assisted design) is in the process of revolutionizing drafting, design and engineering jobs. Don't buy stock in companies that make drafting tables. The CAD system will soon do to the T-square and other drafting tools what the calculator did to the slide rule. Training for drafters, designers, and engineers will still include some board experience, but it must also provide some computer-assisted experience.
8. SEMICONDUCTORS ARE STILL HOT---The semiconductor industry is still "hot." As more chips with larger memories are demanded, the industry will continue to search for ways to turn silicon sand into random access memory devices and mass produce them at low cost. Biological memory chips are under development. Many technical jobs will be created to design, manufacture, and test semi-conductor devices.
9. PROPRIETARY SCHOOLS DO IT BETTER---The electronics industry is frequently disappointed with the graduates of public institutions compared to the graduates of proprietary schools. The challenge to upgrade faculty and equipment in electronics is vitally important! Why can't we do it better, given our tax support? How can proprietary schools make a profit, pay taxes, and be be seen as doing a better job?
10. COMMUNICATIONS IS EXPLODING---The communications industry is growing and changing rapidly. Wires and cables have begun to yield to microwaves, optical glass fibers, cellular telephoning, and satellite communications. We can now make personal telephone calls from commercial planes in flight. The microprocessor chip is making possible so many innovations that few of the

telecommunications jobs of 5 years ago will be in existence 5 years from now. There will be many openings for workers in the communications field. If the movie "The Graduate" were made today, the advice would not be "go into plastics"; it would be "telecommunications."

11. AEROSPACE AND MILITARY LEAD THE WAY---The aerospace industry, especially the military portion of it, is setting trends and creating innovations in the use of lasers, computers, CAD/CAM, robots, and also in the training and development of its employees through videodisc and other interactive computer-assisted television-mediated learning systems. The military has become a first-rate educator. We should imitate some of their educational methods.

12. SOFTWARE IS IN A PREDICAMENT---The educational software is in a predicament. Programming computer software takes a great deal of time and a great deal of money. Development costs are difficult to recover from sales when product demand changes almost daily and it's so easy to pirate software on disks. Eventually, there will be some major breakthroughs to allow users to interact directly with computers through high level languages and even through the spoken word. The development of such systems will eventually reduce the demand for programmers, although this won't happen until almost the turn of the century. In the meantime everyone is "passing the buck" about who should develop educational software. The hardware manufacturers don't want to pay for it. They want teachers to spend thousands of hours creating a program, then trade it for a new printer. The publishing houses are afraid to invest the necessary money into anything so "soft," since

all their experience in in "hard" copy. Educators don't have in place a viable reward system for software development. Professors get tenure if they publish a book, but no reward at all for inventing a new Visicalc.

These twelve conclusions, opinions, predictions or suggestions just mentioned seem to be the most significant ideas given by industry leaders to educators from all over the country during our series of national conferences on high technology. Hopefully you will also find them useful.

Now I'd like to turn my attention back to the report of the National Academy of Sciences. It is entitled High Schools and the Changing Workplace: The Employers' View. The report had a precise focus: to define the educational competencies that will be needed by the high school graduate for success in the workplace, both at entry-level and throughout a 45-to 50-year career in a constantly changing economic environment.

The National Academy of Sciences panel represented many types of public and private sector employers, among them agricultural, electronic, automotive, chemical, construction, retail, health care, communications, and food industries as well as financial institutions and the federal government, including the military services. Labor unions were representated on the panel, as were scholars from leading universities and governmental agencies who have examined the forces that will influence the occupational environment in the years ahead. Finally, the educational community was represented on the panel to contribute professional perspectives at state and local levels. The panel included 20 persons, including (as I said) your State's own Secretary of Education, Dr. Casteen. The panel chair was Richard Heckert, Chief Operating Officer of the DuPont Company.

Let me tell you the panel's three basic findings:

1) The major asset required by employers of high school graduates seeking upwardly mobile careers is the ability to learn and to adapt to changes in the workplace.

2) There are 10 core competencies that can provide the basic understanding and skills needed to both perform entry-level jobs and to continue the learning process. They are:

- Command of the English Language
- Reasoning and Problemsolving
- Reading
- Writing
- Computation
- Science and Technology
- Oral Communication
- Interpersonal Relationships
- Social and Economic Studies
- Personal Work Habits and Attitudes

3) A positive attitude and sound work habits are of basic importance, since employers place a high value on reliability and cooperation.

The report of the panel elaborates on each of the 3 basic findings and on each of the 10 core competencies. For our purpose here let me say this:

- Regarding the ability to keep on learning all through life and to adapt to changes in the workplace---research shows that most individuals work for an average of 10 employers over a working lifetime. Most high school graduates must start at the bottom and will advance to the most desirable jobs only if they acquire specialized skills. The skill needs are constantly changing because of demography, international competition, new technology, and changing employer-employee relations. Unless a worker knows how to learn and how to change, good steady employment will be almost impossible.
- Regarding the 10 core competencies--these are general or basic education and they cannot be omitted, according the the panel.

Technical education, vocational training and curricula providing specific job skills can enhance a student's employability, but they cannot substitute for education in the core competencies.

- Regarding the need for a postive attitude and sound work habits---experience shows that people who lose their jobs usually do so because they have an uncooperative attitude, or can't get along with others, or are undependable---not because they lack ability or skills. There are some exceptions, of course, as in a plant shut-down, but attitude and good work habits help one keep a job.

The 10 core competencies are not new ideas. Many educators feel they already form the core of high school curricula. However, from the employers' perspective, too many graduates leave high school without them. This message seems to me to lie at the heart of what employers are telling us. Too many graduates of our high schools and colleges enter the work force without adequate command of the core competencies.

Let me tell you a story that shows how difficult it is to simultaneously serve the needs of students and the demands of employers. I was moderating a forum at the annual convention of the American Association of Community and Junior Colleges in New Orleans. A speaker from IBM had begun telling the audience about the technical skills that should be mastered by Associate degree computer science and electronics graduates. He stopped reading his prepared text half-way through and said, "This is crazy! We see hundreds of job applicants with associate and even bachelor's degrees who can't even read, write, and do arithmetic. Why am I spending all this time outlining an electronics curriculum for a small percentage of your students? Teach them all basic skills! Teach them to read, write, spell, do math---teach them to think and to learn---then send them to us and we'll find a way to teach them about computers and electronics."

There was a smattering of applause from the audience. The IBM executive ended his speech then, and sat down somewhat discouraged.

At the back of the room a hand was raised and, as moderator, I recognized a well-respected and experienced college president from the same state as the IBM executive. He said, "I hear you, Mr. IBM---and on one level I can agree with you. Then I pick up a newspaper, and read the classified ads. Company after company is searching for new employees provided they have technical skills: program in COBOL, type 80 words per minute, registered nurse, electronics technicians, persons certified or licensed to do this or that. None of the ads ever says 'Apply if you can read, write, and do math'! Until your personnel office, Mr. IBM, plays the same tune that you play in top management---until we know whether you want generalists or specialists, we are going to continue helping our students qualify for the jobs we see advertised." The room then erupted in applause! It was clear that most of the educators agreed with this position.

Here's our dilemma - liberal education or vocational education? In the past, we did either one or the other in our high schools, tracking better performers into liberal education and the others into vocational training. Now, both types of students seem to need both kinds of education. How can we do it all? How can high school students do it all?

In postsecondary education the dilemma is no different, except that we don't call it vocational education, but we call it "choosing a major." Whether they earn a two-year degree, a bachelor's degree, or a graduate degree certain core competencies are necessary for everyone,---and unless these are mastered, whether in high school or in college or on one's own, prospects for steady employment are quite dim. In addition, specific job skill requirements are changing faster than ever before. Our education must

adapt just as fast.

One final anecdote---an industrialist from South Carolina was propounding his views about education, telling educators to plan programs with a view to tomorrow's jobs, not today's jobs. A questioner asked him point-blank, "How many jobs will your company have four years from now?---how many secretaries?---how many engineers?---how many programmers? ---how many machine operators?" The industrialist replied, "I don't know those answers for four years ahead, or one year, or even four months! I have orders now that guarantee work in my plant for the next 3 months. After that---unless my salespersons bring in more orders (and I'm confident they will!)---unless they bring in more orders, our plant will close. And when they do bring more orders, then I'll know how many employees of each type I'll need to fill them."

You see, the problem is not a simple one. Don't believe anyone who gives you a simple solution. I won't propose a simple solution in this opening address---you wouldn't believe it, if I did. We are making progress, however, and if we can avoid the temptation to blame each other ---if we can forget about placing blame entirely, and get on with the task of doing our jobs (individually and collectively) as well as we possibly can, then we will see a veritable olympics of progress. Your attendance at this conference and the professional development it brings you constitute a winning event in the olympics of educational progress. I congratulate each of you (and your State leadership) for this summer conference on vocational guidance and counseling. The program looks splendid!

My final word to you tonight is this let's listen to employers---listen to them carefully---then let us prepare students for the future as dictated by our common sense, our professional training, and our conscience.